about three inches long on the right side of the abdomen. The surgeon reports that the examination showed only enlargement and hardening of the pancreas, and the incision was closed. Four weeks before admission to the hospital, that is four years later, a fistula formed in this incision, from which fecal matter and bloody mucus were discharged from time to time. The patient had much pain in the abdomen. The appetite was lost and there was nausea and vomiting of practically everything. She could sleep only under the influence of morphine. At this time she was under the care of Dr. William Evans, with whom I saw her in consultation. He suggested that she be admitted to the Presbyterian Hospital on the service of Dr. H. R. Wharton. The examination showed some resistance just above the umbilicus, but no definite mass, and considerable induration in the right lower quadrant around the sinus. There was considerable tenderness in this region, and diffuse tenderness over the lower portion of the abdomen. The patient was extremely emaciated and pale. There was a loud systolic murmur at the pulmonic cartilage. After admission to the hospital, the urine was examined and found to contain sugar, and Dr. Goodman reported that the Cammidge test was intensely positive. The patient was therefore given extract of pancreas in glutoid capsules. She improved very rapidly. The fistula closed, reopened, and again closed, apparently permanently. The sugar disappeared from the urine, and fifteen days after her admission the report was practically negative. A second Cammidge test, however, was not done. On admission, the red blood cells were 2,930,000. Her weight on August 28 was eighty-five and one-half pounds, and on September 8 it was ninety-six pounds. At this time she was up and about the ward, taking a regular house diet, seemed strong, and felt very well. She said that when she omitted the capsules on one occasion for two days, she felt very uncomfortable in the abdomen, and her nausea returned. She was discharged on October 16, eleven weeks after her admission, practically well. I have since heard from Dr. Evans that she discontinued taking the capsules, but that her condition remained satisfactory.

Although the results in these two cases have been apparently excellent, I have endeavored to keep clearly in mind the fact that no definite conclusions can be based upon two cases, and that the improvement may have been independent of the treatment. I cannot understand how the administration of the extract of the pancreas, which at most can be regarded merely as a substitute for the pancreatic secretion, could bring about any improvement in the actual condition of the pancreas itself, and therefore I do not know why both patients have been able to discontinue the use of the capsules without any apparent tendency to relapse; neither do I understand why such a small amount of extract of pancreas, with its low proteolytic activity and its very moderate digestive power, should so completely substitute for the supposed indispensible pancreatic ferment that the patients are able rapidly to increase in weight and strength. It is conceivable that there are other factors involved, possibly ferments or neutralizing bodies of whose existence we are at most suspicious, but to assume their existence in order to explain our results is simply piling theory upon theory. At best, therefore, we can only conclude that in the present instances the administration of extract of pancreas appears to have improved the patients, and that its use at the present time must be largely empirical, although there is a possibility of a certain degree of substitution taking plaec.

Recently an acute intestinal obstruction due to an incarcerated hernia made it necessary to open the abdominal cavity of the second patient again. The desperate condition of the patient precluded any thorough examination, but the surgeon noted that the gall-bladder was distended, and he was uncertain about the size and hardness of the head of the pancreas. The patient made a good recovery, and it is possible that latter a cholecystenterostomy will be considered.

CONGENITAL HEART BLOCK OCCURRING IN A FATHER AND TWO CHILDREN, ONE AN INFANT.

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Our purpose in this paper is to present briefly the subject of bradycardia and to report three cases in one family, one of them an infant, as instances of heart block, and to show the influence of heredity.

Slow pulse may be physiological, toxic, or infectious, or associated with disease of the arteries, valves, or myocardium. Vagus neuritis, pressure on the vagus, and reflex or direct stimulation of the pneumogastric center in the medulla are occasional causes of bradycardia. Diseases of the spinal cord, pons, or medulla may lead to pressure on the vagus; bradycardia may be found in cases of brain tumor, especially those of the cerebellopontine angle, and is commonly present in tuberculous meningitis. The slow pulse following the infectious fevers is usually transitory in nature and may indicate real heart block.

Schuster has reported a curious case of bradycardia of intermittent type, not showing the Stokes-Adams syndrome, in a girl, aged four years, with infectious myocarditis following rheumatic fever, which, after several weeks' duration, resulted in a complete recovery. In Schuster's case, five weeks after the onset of acute articular rheumatism, attacks began in the evening with small irregular pulse, of lessened frequency, as low as thirty-five, fall of temperature, slow respirations (10), weakness, restlessness, and profuse sweating; these attacks lasted from one to three hours. The radial pulse and heart beats were synchronous. For three weeks these attacks recurred nightly, then at intervals for several months more. Schuster[1] assumed infectious myocarditis to be present.

W. von Starck[2] reports the occurrence of the Stokes-Adams syndrome in a boy, aged five years, who suffered from a severe gastroenteritis, and whose heart became hypertrophied while under treatment for the enteritis. The pulse rate varied from 28 to 44, was usually 36. Murmurs were heard all over the precordium. No venous pulse was visible. On recovery from the enteritis three attacks of unconsciousness ensued, lasting one-half to one hour, with general convulsions; the last attack was fatal. Autopsy showed recent endocarditis on the posterior wall of the left ventricle, valves intact, marked cardiac hypertrophy, marked enlargement of the bronchial lymphatic glands, slight interstitial nephritis. Von Starck considered vagus compression from bronchial glands the cause of the slow pulse.

According to Edmund Neusser, a physiological cause for bradycardia is diminution in the automatic excitability of the heart muscle; or we may have diminished blood supply to the medulla on account of aneurysm, aortic stenosis, or arteriosclerosis of the basilar artery. Perhaps the most common condition found at autopsy in marked cases of heart block is sclerosis of the coronary arteries and cardiac fibrosis with degenerative changes involving the bundle of His. Among the toxic causes of bradycardia may be mentioned uremia, jaundice, lead-poisoning (chronic), ptomaine poisoning, etc., and the abuse of drugs such as digitalis and strophanthus.

According to the myogenic theory, the ventricle is stimulated to contract by the impulse which passes from the auricle through the bridge of primitive (embryonal) tissue that connects auricle and ventricle, known as the bundle of His, or atrioventricular bundle. Partial or complete block of the heart results from depression of conductivity in the atrioventricular bundle, when the stimulus occasionally or regularly falls to cross the auriculoventricular junction.

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[1] Deut. med. Woch., 1896, No. ix.

[2] Monatsschrift f. Kinderheilkunde, 1903, ii, p. 11 to 15.

James Mackenzie divides cases showing diminished frequency of the pulse into four classes: (1) Those in which all the chambers of the heart participate in the slow action (true bradycardia). (2) Those in which the slow pulse is due to a missed beat or extrasystole, the ventricle having contracted, and the resulting pulse wave being too feeble to reach the wrist (e. g. pulsus bigeminus). (3) Those in which the auricle has ceased to beat, or does so synchronously with the ventricle (type of nodal rhythm.) (4) Those in which the stimulus is blocked between the auricle and ventricle so that the auricle beats at its normal rhythm and the ventricle does not respond to the auricular systole, but pursues an independent and slow rhythm—complete heart block.

True bradycardia is encountered in people enjoying perfect health, with pulse rates of fifty to sixty per minute. Most of Mackenzie's cases were tall men.

When there is a genuine bradycardia due to direct or reflex vagus excitation, the pulse rate will be increased by the administration of atropine. If the slow pulse is due to complete heart block, atropine will increase the rate of the auricular systole, but not that of the ventricle (Hoover). In analysing cases of bradycardia the relations of the radial pulse, the heart's impulse, and the venous pulse in the jugular must be compared.

CASE I.—Mr. B., aged forty-one years, contracted typhoid fever in 1889 (at the age of twenty), and suffered from dyspepsia of severe type afterwards. He was treated for gallstones from 1895 to 1900; since then he has been comparatively free from pain and has had no severe attacks.

On one occasion after severe exertion lasting all day, he had general epileptiform convulsions. Attacks of angina pectoris recurred at frequent intervals after this seizure, 1894, 1896. At present Mr. B. is pale, suffers from dyspnœa on exertion, and vertigo on stooping. His arteries show moderate thickening. His average pulse rate is 50 per minute. Lues and alcoholism are excluded. He has worked hard all his life.

CASE II.—Oldest girl, May B., aged twenty years. Pallor marked in infancy. Diphtheria once, not followed by cardiac weakness. Pertussis lasted over three months, followed by persistent cough. Subject to nosebleed. Menses at thirteen, not regular and painful. Suffers from occipital and frontal headache, of the neurasthenic type. Loses her "wind" easily. Does not suffer from vertigo, faintness or dizziness, and has never had convulsions. Pulse 68 in sitting posture, 60 lying flat.

CASE III.—Willa B., aged fourteen years, was always a "nervous" child. At the age of eight years she had her first attack of general convulsions, which came without warning, lasted one to one and a half hours; mother noted complete unconsciousness, pallor, and sweating. No record of pulse was made. There was no vomiting or involuntary micturition. She recovered quickly. These attacks recurred three to four times a week for the next six months, then about once a week for two or three months longer. There have been no attacks in the past five years.

CASE IV.—Leroy B., born April, 1908, full term. The mother nursed the baby altogether for six months; after that supplementary feeding was given and there was considerable digestive disturbance and constipation. Pallor, which was noted from the first, became more marked after the sixth month. The baby was easily fatigued at that time, would sweat freely, and showed dark circles around the eyes. There was never much vomiting, but intestinal indigestion was evident. The abdomen was moderately distended, and the evacuations often of greenish color and offensive. The slow pulse was noted during the first week and varied from 40 to 50; was slower during sleep. In March, 1909, a severe attack of bronchopneumonia occurred, with high fever and extensive involvement of the lungs. While cyanosis was pronounced after severe spells of coughing, on the whole the color was good and the heart withstood the strain of the disease well.

March 1909. Notes made at this time were: Moderate enlargement of the heart to the right (1 cm. beyond sternum). Apex beat forcible, first sound loud, followed by systolic murmur, loud and blowing in character and not transmitted into the axilla or into the vessels of the neck. A systolic thrill was felt all over precordium, and the second pulmonic sound was accentuated. Pulse 58, somewhat irregular. Small doses of digitalis were ordered, and the pulse rate fell during convalescence to 40. The illness lasted one month.

December 2, 1909. Pulse strong and full, 50. Impulse forcible. Apex beat in fifth interspace just outside nipple. First sound of heart clear and strong. Now and then a soft systolic murmur is audible over base of heart. Second pulmonic sound loud, now and then reduplicated. No venous pulse visible.

January 3, 1910. Cardiac dulness extends 1 cm. to right of sternum and 7 cm. to left. Apex beat forcible, fifth interspace just outside nipple line. Epigastric pulsation is present, and a thrill is felt in right carotid. A murmur is heard over whole precordium, louder and rougher at base. Sometimes there is an intercalated sound suggesting imperfect systole. Second pulmonic is louder than the second aortic sound; the former is appreciably accentuated. Pulse 50, full and strong. No jugular pulse, but diastolic venous collapse. Liver one finger below costal border in nipple line. No rachitis. No signs of arteriosclerosis. Belladonna in full doses does not increase the pulse rate, nor does exertion.

Urinalysis shows no albumin, sugar, or casts. The body is rather undersized.

Blood examination showed a low hemoglobin, 65 to 70 per cent.

April 5, 1910. Pulse 42, same in recumbent posture, not affected by exercise. Color good. Evidence of intestinal indigestion.

The child is bright, vigorous, and intelligent. It was at one time thought that the cardiac murmur above described was due to a patulous interventricular septum, which would, of course, have had an important bearing on the condition of the auriculoventricular bundle, but for reasons which need not be discussed the idea was relinquished.

Pulse tracing 1 was taken from J. S. B., the father, who, it will be remembered, suffered for a long time with syncopal attacks and angina pectoris. It shows an incomplete block with a three-to-one rhythm. The fact that the supernumerary waves in the phlebogram are true auricular waves and not due to extrasystoles is shown by their regular rhythm, and by the absence of any extrasystoles in the cardiogram. It seems quite likely that the severe symptoms referred to above were produced by a complete block. Unfortunately we have no records to show what the radial pulse was at that time. The fact that swallowing, which temporarily stimulates the vagus nerve produces acceleration of the brachial rate, is followed by but very slight slowing, indicates that the tenth nerve does not play the leading role in the production of the auriculoventricular incoördination.

Tracing 2 was taken from the baby, aged twenty-two months, while the radial rate was forty-two. Some of the waves are not as well marked as could be wished, but considering the difficulty in making records from an infant, they are quite satisfactory. There seems to be complete block since the *a* waves in the jugular bear no constant relation to the brachial waves. There can be no question of the fact that there is distinct auriculoventricular incoördination.

Tracing 3 was made from May B., the eldest daughter. It shows an incomplete block with a two-to-one rhythm. The brachial tracing shows an extrasystole which is not followed by a compensatory pause and must therefore arise either in the auricle or in the auriculoventricular bundle. This indicates that the stimulability of the heart muscle is not depressed and that the incoördination is not due to depression of excitability. The auricular waves appear fairly regularly showing that there is no abnormality of stimulus production, and the *a-c* interval preceding each brachial pulse does not exceed the normal limits. It would seem, therefore, that the incoördination was due to the fact that the bundle of His could not recover its functional activity in time to transmit every auricular stimulus, and therefore missed every other one, this doubled period

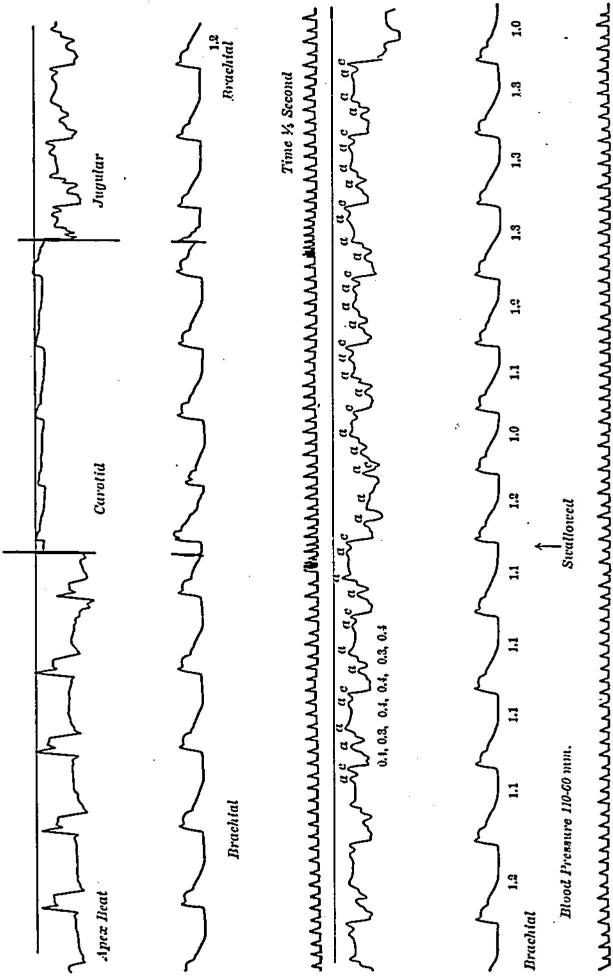

Fig. 1.—Pulse tracings from J. B. S., the father, showing an incomplete block with a three-to-one rhythm. The tracings from the apex beat and the carotid artery are in coördination with the brachial waves, thus excluding the possibility of missed peripheral pulsations due to extrasystoles. Following the act of swallowing, the auricular and the ventricular rates are first increased, then decreased. Pulse rate, 52. Time recorded is one-fifth of a second.

of rest being sufficient completely to restore its functionation. This girl has never had any definite cardiac symptoms; and yet she is accustomed to work hard. She is, however, pale, never feels

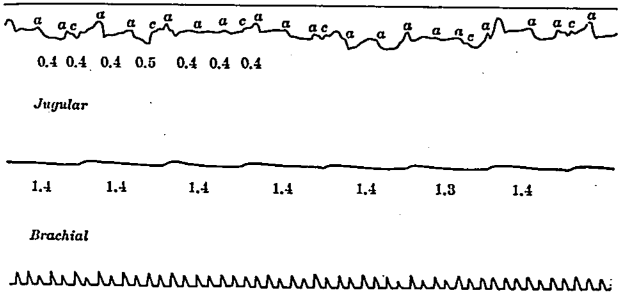

FIG. 2.—Pulse tracing from Le R. B., aged twenty-two months, showing apparently a complete heart block. The interpretation of some of the waves may perhaps be questioned, but considering the difficulty of "tracing" such a young subject, a better result could hardly be expected. Certainly there is a block. Time recorded is one-fifth of a second.

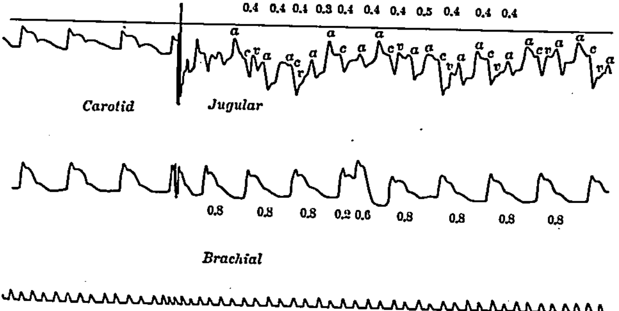

FIG. 3.—Tracing from May B., aged twenty years, showing incomplete heart block with a two-to-one rhythm. In the brachial tracing an auriculoventricular extrasystole occurs, preceded by no *a* wave in the jugular, and followed by no compensatory pause. This indicates that although the conductivity of the bundle is depressed, its irritability is increased. The carotid tracing shows no incoördination with the brachial. The patient is pallid, suffers almost constantly from headache, and although she works hard in the store, rarely feels well. Pulse rate, 75. Blood pressure: systolic, 120 mm.; diastolic, 75 mm. Time recorded is one-fifth of a second.

very well, and is a great sufferer from headaches. At the time the tracing was made she was somewhat excited, and the pulse rate was 75; it is generally about 60.

Tracing 4 was made from Willa B., the second oldest daughter, aged fourteen years. She is fairly well developed, but rather pale. For several years she suffered from syncopal attacks which came on while she was sitting quietly at school or at the piano. The attacks were followed by convulsions which were very severe. It was thought at the time that they were epileptic in character. She has outgrown

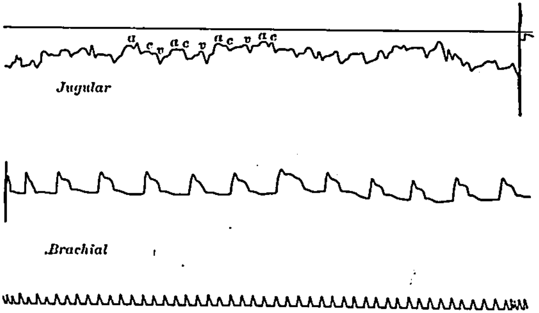

Fig. 4.—Tracing from Willa B., aged fourteen years, showing normal auriculoventricular coördination. Pulse rate, 80. Blood pressure: systolic, 120 mm.; diastolic, 62 mm. For many years she had syncopal attacks while in school, or while playing the piano, often followed by severe convulsions. This condition continued for nearly one year. It was thought that she was epileptic. She is now in excellent health, without cardiac symptoms. Time recorded is one-fifth of a second.

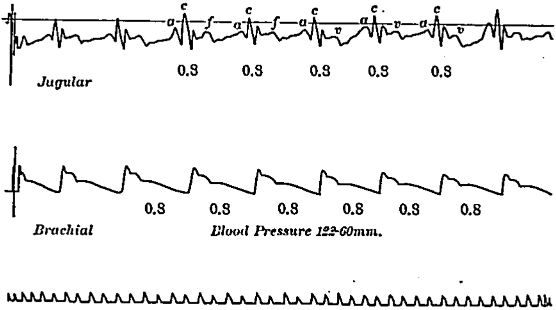

Fig. 5.—Pulse tracing of J. B. B., aged sixteen years, showing normal auriculoventricular coördination. He is robust, and engaged in strenuous athletic contests. He has never had any cardiac symptoms. Pulse rate, 80. Blood pressure: systolic, 122 mm.; diastolic, 60 mm. Time recorded is one-fifth of a second.

this condition and is now in good health. It seems more than likely, when we consider the other cases in the family, that these attacks were the result of heart block. The tracing shows a brachial pulse rate of 80 and no abnormalities.

Tracing 5 was made from J. B. B., the eldest son, aged eighteen years. He is a healthy, well developed, robust looking man, who is at present actively engaged in track athletics. He has never had any cardiac symptoms; in fact, prides himself on his "wind." The blood pressure and the pulse tracing are normal. Pulse, 80.

These cases which we have reported are, so far as we are aware, unique in the history of medical literature. A father and two children, one an infant, whose auricles and ventricles are constantly in a state of incoördination, with strong probabilities that one of the other children was for a period of over a year afflicted with a similar condition is certainly most surprising. Until within a very short time it seemed fairly well established that when a condition of auriculoventricular incoördination existed for prolonged periods of time, we were dealing with some degenerative changes in the bundle of His, such lesions as gummas, sclerosis, necrosis, fatty degeneration, etc., having been demonstrated in a large number of instances. It had, of course, been observed that following acute infections there might be a temporary heart block, generally symptomless except for the slowness of the pulse. Furthermore, the occurrence of block following the administration of digitalis in some cases showed that there might be a temporary depression of conductivity, but this class as well as the preceding one might justly be described as toxic in origin, the former to an infection, the latter to a drug. The case of heart block with intermissions and recurrences of the condition recently reported by Earnshaw[3] shows that we still have much to learn regarding the pathology of the auriculoventricular bundle, and the cases which we here report while quite different in character, lead to a similar conclusion. To find an hereditary and apparently congenital tendency to auriculoventricular incoördination is certainly very suggestive. It naturally leads to the thought that perhaps some of the people who "normally" have pulses ranging in the sixties may have some defect of conductivity. Thus Osler[4] mentions a family most of whose members had a pulse rate of about sixty, one of whom died of the Adams-Stokes syndrome. The records which have come down to us regarding the slow pulse and convulsive attacks of Napoleon are interesting, but there seems to be some doubt of his having had the bradycardia.

Our tracings clearly show that the bradycardia is not due to negative chromotropic influences—abnormal stimulus production—

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[3] Amer. Jour. Med. Sci., April, 1910.

[4] Lancet, Aug. 22, 1903, p. 517,

since the *a* waves appear with regularity in the phlebogram. They also show in Case III that they are not due to negative bathmotropic influences—depression of stimulability—because a nodal extrasystole occurs. They further demonstrate that the slow pulse is not due to negative inoptropic influences—depression of contractility—because the brachial pulses are full and strong, and show no suggestion of a pulsus alternans. We have but one other possible cause of bradycardia left, and that the commonest cause, namely, negative dromotropic influences or in other words, depression of conductivity.

Concerning the cause of the depression of conductivity in the present series of cases, we can only speculate. Gross anatomical changes in the bundle can be excluded, as can also toxemia. Belladonna administered to the baby until the full physiological effect was manifested by flushing, produced no results on the pulse rate, a fact which tends to corroborate the conclusions which we have drawn from the pulse tracings, to the effect that the vagus is not to blame for the depression of conductivity. Thus tracing 1 shows that the act of swallowing which stimulates this nerve, first increases then decreases both the auricular and the ventricular rates. Another tracing from Case III, which is not reproduced, also shows an increased ventricular rate after deep breathing and swallowing, the pulse intermissions dropping from 0.8 to 0.6 and then increasing to 0.9 of a second.

There is evidence to show that digitalis, which slows the pulse, does so mainly by decreasing the auricular rate and through it the ventricle, and this drug acts upon the human heart mainly through the pneumogastric nerve. Stimulation of this nerve has also been shown to depress conductivity, since atropine which inhibits the action of the nerve, may modify or cause a heart block to disappear. Our tracings show, however, that stimulation of the vagus by swallowing is productive of only very slight results, hardly more than could be considered normal. If overaction of the vagus were responsible for the block in our cases it is more than likely that we should get some more striking results from the stimulation and depression of this nerve than has been the case.

The most reasonable hypothesis which we have been able to formulate to explain our cases is that we are dealing with a congenital physiological and perhaps anatomical abnormality in the auriculoventricular bundle or its blood supply, by virtue of which conductivity is restored more slowly than normally.

THE DURATION OF PREGNANCY, WITH A NEW RULE FOR ITS ESTIMATION.

By Ellice McDonald, M.D.,
of New York.

The duration of human pregnancy is a question which has been debated by medical men of all ages. The extent of our ignorance has been but little decreased since the devout remark of the great Arabian physician, Avicenna, that "at the appointed season labor comes on by command of God." This observation is generally admitted to be correct. The study of the question is obscured by the difficulty of knowing with exactitude the date of coitus; and when the date of a single coitus is known, it is clear that conception may occur at any day before the first missed menstruation. The length of time during which spermatozoa may live in the vagina and uterus before conception is still unknown, but there is no doubt that this may be for a number of days.

For this reason, in our estimation of the duration of pregnancy it is customary to reckon from the first day of the last menstruation. This allows for an error in the reckoning of at least three weeks. Ovulation is by no means limited to menstruation, and fecundation may take place at any time during the interval between two menstrual periods. Often, however, when there has been but a single coitus, the day of copulation is also the day of conception, or the first day of pregnancy. A number of such cases of conception after a single intercourse were collected by Reid,[1] in which 25 of 43 cases showed the duration to be from 270 to 280 days reckoning from the single intercourse, and in 11 cases pregnancy was prolonged beyond 280 days. One case was delivered 300 days after the single intercourse. Isolated cases of pregnancy after a single coitus have since been reported; but no such large series has been collected.

Observation on animals, particularly cows, whose time of pregnancy is nearest to that of women, have shown that their period of gestation is by no means a fixed time, but may vary from 240 to 321 days. Tessier's[2] researches, conducted with unusual care over a period of forty years, showed that, while the average duration of pregnancy of cows was 285 days, 321 calved between the 280th and 297th days, 6 at the 298th day, 4 at the 299th day, and 10 between the 300th and 321st days. Earl Spencer s experiments in 724 cases corroborate those of Tessier in that 310 cases calved before the 284th day and 314 after the 285th day. While the variation of the duration of pregnancy in cows is no proof of a similar variation in the human animal, it is at least suggestive that a similar variation may or does occur in pregnancy in women.

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[1] Lancet, 1850.

[2] Mémoires de l'Académie Royale de Science de l'Institut de France, 1819, ii, 1.

There is no doubt that pregnancy in women may be prolonged in a certain percentage of cases, and numerous instances of abnormally long pregnancy have been reported. Winckel[3] has collected 20 cases which he has discussed in detail, and has accepted 6 cases as authentically proved prolonged pregnancy of 310, 311, 312, 324, and 336 days, with children weighing from 5770 to 7470 grams. Nine of the remaining cases he rejects as not proved, and five were not completely satisfactory. Many other isolated cases have been reported, such as those of Allen[4] and many others.

While it is difficult in many cases to estimate exactly the probable time of conception, it is conceded by obstetricians generally that prolongation of pregnancy does occur, and that the children of such pregnancies are remarkable for their large size. It is also believed that a proportion of overweight children are carried for more than the average time of pregnancy. While admitting that isolated observations prove nothing in this connection, it is evident that the average duration of many hundred cases weighing 4000 grams, and over, must have considerable force. Winckel has collected 245 cases of this great weight and estimated the duration of the pregnancy as follows, as to the time after the last menstruation:

Duration of pregnancy in days.	After last menstruation.
241 to 260	3.7 per cent.
261 to 270	6.1 "
271 to 280	18.3 "
281 to 290	38.0 "
291 to 300	18.8 "
301 to 310	8.5 "
311 to 336	6.6 "

This collection shows that it is not an isolated occurrence that heavy-weight children are carried beyond the ordinary term of pregnancy; but it is a fairly definite proof that children are often overweight because they are carried for longer than the ordinary term. While it is true that large infants may be the result of short pregnancies, as was the case in 3.7 per cent. of these cases, it is more common that heavy children are the result of pregnancies longer than the average 280 days, as was the result in 71.8 per cent. of this series.

In 31 of the larger babies with an average length of 53.8 cm. and an average weight of 4276 grams, the prolongation of the gestation period was 31 days, counting from the last menstrual period. The average prolongation of the gestation in infants weighing 4000 grams, or slightly less than the preceding, was 8.22

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[3] Leyden's Deutsche Klinik, ix, 5 to 10.

[4] Amer. Jour. Obst., 1907, lv, 4.

days, reckoning in the same way from the last menstruation. Thus, also, in children weighing 4000 grams it was found that 30, or 12.2 per cent., had a gestation period of longer than 302 days, the legally determined duration of pregnancy in Germany.

Blau and Christofoletti[5] also have collected the cases of large children from 68,032 births in the clinics of Schauta and Chrobak for the years 1892 to 1901, in order to determine the correlation of large children and protracted gestation. Among 1778 children weighing more than 4000 grams the pregnancy lasted more than 300 days in 150 cases, and more than 302 days in 135 cases.

There seems, therefore, to be conclusive proof that pregnancy may persist for longer than 280 days, and that, when it is prolonged over term, the resulting child is commonly of large size. These cases cited were clinic cases where conditions were not favorable to large children, as repose favors the increase in weight of the child. Rest, as has been proved by Pinard,[6] is a factor which may distinctly prolong the pregnancy. This may explain the difference between gestation in summer (277.2 days) and winter (279.5 days) or between married (282.4 days) and unmarried (278.2 days), as has been shown by Pinard.[7] This influence of quiet and rest will also explain the larger number of heavy children found in private practice, as the luxury of a home influences the weight of the fœtus. Letournier[8] has shown that women who have fatiguing work to do have children lighter in weight than those who are able to rest during their gestation. He found an average difference of 220 grams between these classes.

The type of menstruation, the sex of the fœtus, and heredity are all said to have effect upon the size of the fœtus and the duration of pregnancy; but none are proved to have any influence.

On the other hand, constitution and habitus do seem to have an influence, as Issmer[9] found an average duration of 278.6 days in robust women, and 276.8 days in weak women. He also states that there is an average increase of weight of the child in each pregnancy of 224.5 grams. The first child is the smallest, as a rule, and each succeeding pregnancy produces a larger child up to the ninth.

Another artificial cause of prolonged pregnancy is the performance of the operation of ventrofixation of the uterus. A number of long pregnancies with very large children have been reported after this operation. The most likely explanation is that the unequal development of the uterus and the thinning of the posterior wall causes the cervix to be displaced in its relation to the pelvic axis. The early pains, being weak from the thin walls, are not able to press the presenting part into the os to bring about dilatation. From the various reports it appears that the pains came on and passed off again several weeks before birth actually occurred.

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[5] Monats. f. Geburtsh. u. Gyn., 1904.

[6] Dictionnaire de Physiologie, 1905, article Gestation.

[7] Clinique Obstétricale, 1899, 51.

[8] Thése de Paris, 1897; De l'influence de la profession de la mère sur le poids de l'enfant.

[9] Arch. f. Gyn., xxx, 277, and xxxv, 310.

The following list of cases shows the tendency toward the prolongation of pregnancy, and forms another argument against the performance of this operation in child-bearing women:[10]

Author.	Para.	Last menstruation.	Labor.	Duration of pregnancy.
Kissler,	2	February, 1903	December 10, 1903	About 43 weeks.
Lynch,	4	11 months antepart.	April 9, 1902	About 44 weeks.
Fuchs,	8	June 4, 1898	March 29, 1899	About 43 weeks.
Kallmonger,	2	August 18, 1897	June 16, 1898	About 43 weeks.
Rick,	3	March 17, 1897	January 16, 1898	About 43 to 44 weeks.
Rick,	5	June 24, 1896	April 5, 1897	About 41 weeks.
Rick,	6	March 28, 1897	March 28, 1898	About 52 weeks.
Stahler,	2	3 weeks overdue	....	About 43 weeks.
Ahlfeld,	3	Middle of May, 1902	March 19, 1903	About 44 weeks.
Ahlfeld,	3	March 26, 1905	January 10, 1906	41 to 42 weeks.

This phase of the subject is worthy of further study, and it would be well if those reporting cases of pregnancy after anterior fixation should note the duration of pregnancy and the weight and length of the child.

While thus it may be seen that many factors affect the duration of pregnancy, Issmer has also estimated that the size of the fœtus bears a relation, as a rule, to the duration of pregnancy, as follows:

48 cm. length averages	271.3 days.
49 cm. length averages	278.4 days.
50 cm. length averages	277.1 days.
51 cm. length averages	282.5 days.
52 cm. length averages	283.6 days.
53 cm. length averages	286.5 days.
54 cm. length averages	290.0 days.

He states that there may be a difference of ten to eighteen days in the duration of pregnancy; but, basing his statements on the average of his large collection of cases, he says that the larger the child the longer is the pregnancy, and that the increase is in the proportion of his table. Large children do also occur in shorter pregnancies, but they are much more infrequent than when the pregnancy is prolonged.

These variations in the duration of pregnancy make it difficult to prognosticate the date of labor. If the usual rule is applied of adding seven days and subtracting three months from the date of the last menstruation, the estimate may be three weeks out of the way; but basing it upon the average duration of pregnancy, it is often correct. However, conception may have occurred immediately before the first missed menstruation, and so give a factor of error.

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[10] Deutsche med. Woch., 1906, vii, 250. See complete literature.

Schatz,[11] in two abstruse papers, has claimed that pregnancy is divided into physiological double months and periods of various kinds, and claims that labor occurs at the termination of one of these. It is based upon the electric tension of the air, as shown by Arrhenius to be 27.3 days and which Schatz claims to be paralleled by the average duration of menstrual periods. This theory differs but in the complexity of its language from that held by ancient obstetricians, that labor occurred upon the date of a menstrual period. Unfortunately, however, there is no such exactitude, and the obstetrician must continue to take his fitful rest with one ear, cocked, listening for the telephone bell announcing the advent of a labor, the date of which he has no means of exactly determining.

Since, however, the attempt to estimate the duration of pregnancy by the number of days is inexact, it might be well to attempt to estimate the duration of pregnancy from the size of the fœtus. For, if the fœtus may be measured and the average size of the fœtus is known, the date of labor will be when the fœtus arrives at average size in the great majority of cases.

So, with the hope of being able to determine the date of labor, I have evolved a rule which is dependent upon the height of the fundus of the uterus above the symphysis. The height of the fundus is dependent upon the occipitococcygeal measurement of the child, and this varies in direct proportion to the weight of the child, as does the length. The details of this proportion have been worked out in a previous paper.[12]

The rule is as follows: The duration of pregnancy in lunar months is equal to the height of the uterus in centimeters divided by 3.5. It depends upon the more or less regular growth of the uterus of 3.5 cm. each month of four weeks, and is very exact after the sixth month. The measurement is taken with the patient lying flat (see figure), and one end of the tape is placed at the upper border of the symphysis, while the other is held by the thumb into the palm of the hand. The fingers of the upper hand are held at right angles to the fundus of the uterus, and the tape follows the contour of the uterus save at the last dip, as is shown in the illustration. Multiparæ with lax abdominal walls and thin uteri should be supported at the side, so as to bring the occipitococcygeal axis of the pelvis into the long axis of the mother's body.

This method gives satisfactory results and is the most exact means of estimation of the duration of pregnancy. It is strictly an estimation of the size of the fœtus; for when the uterus arrives at the height of 35 cm., or full term ($\frac{35}{3.5} = 10$ lunar months), the fœtus is of a weight of 3300 grams, or average size, as is shown by the measurements in my former paper. Thus, an average-sized baby usually comes at the average period of pregnancy—hence the rule.

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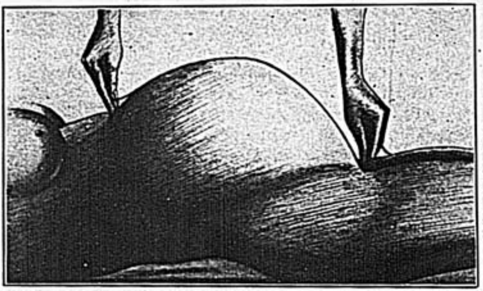
[11] Arch. f. Gyn., lxxxiv, 2, and lxxx, 3.

[12] Mensuration of the Child in the Uterus, Jour. Amer. Med. Assoc., December 15, 1906.

After the sixth month this rule is extraordinarily exact, and is most useful in determining the date of labor and the size of the fœtus, when the date of the last menstruation has been forgotten. It has been in use in my hands since 1904, and I have had good reports of it from many obstetricians, including some of my German confrères. Hamilton has reported it to me to be of great use in asylum practice in insane pregnant women who are not able to give a connected history of menstruation.



Author's rule: The duration of the pregnancy in lunar months equals the height of the uterus in centimeters divided by 3.5.

It may be said that 35 cm. is the usual height of the uterus at full term with a fœtus of 3300 grams. For every centimeter of height above this measurement approximately 200 grams should be added to the weight of the fœtus. Thus, a uterus measuring 37 cm. would contain a fœtus weighing 3700 grams. The measurements are more exact below 35 centimeters, than above that height.

The so-called "sinking" of the fœtus in the last two weeks of pregnancy causes but little error in the measurement, as the head, when the patient is recumbent, rides upward on the pelvic bones and the sinking is not a factor. "Sinking" in my experience is not common in primiparæ, and its supposed presence is often due to the stretching of the abdominal muscles and not to descent of the head into the pelvis. The fundus thus comes lower in the erect position, and no diminution of the fundal height is noted in the recumbent. This is well shown in Hirst's[13] photographs of women at various periods of pregnancy. "Sinking" does, however, in multiparæ sometimes complicate the measurement, but not often. Hydramnios also causes but small error, as the excess of liquid does not affect the fundus, but the body of the uterus, leaving the height of the fundus to be determined by the occipitococcygeal measurement and the size of the fœtus.

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[13] Text-book of Obstetrics.

The rule gives the most exact means at hand of prognosticating the date of labor. No rule can be exact when dealing with such an uncertain quantity as the duration of pregnancy, save that in the majority of cases an average-sized baby is born at the average time.

Thus, if the fundus measures 26 centimeters from the symphysis, the duration of pregnancy is 26 divided by 3.5 or $7\frac{3}{7}$ lunar months, and the patient has $2\frac{4}{7}$ lunar months to go to term, or ten weeks and two days.

This rule, combined with the estimation of pregnancy by reckoning from the last menstruation, gives a fairly exact determination of the probable date of labor.

While the rule is useful for the determination of the date of labor, it is still more useful for the determination of the size of the fœtus, with a view to induction of labor for contracted pelvis or other cause. When the fundal measurement is at or near 35 cm., I never hesitate to induce labor when indicated, knowing that there is a fœtus of the average weight of about 3300 grams and capable of standing instrumental delivery and not liable to die from prematurity.

When used for the purpose of estimating the size of the child in contracted pelvic or other conditions, it should be used in conjunction with the other methods of measuring the head, etc., as noted in my previous paper on this subject.

FURTHER STUDIES OF SARCOMA OF BONE.[1]

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With the knowledge of the structural changes in bone that can be gained by means of the Röntgen rays, and with the aid of the newer viewpoints in the histopathology of sarcoma, we are in a position today to acquire a much more throrough and comprehensive conception of the method of growth of sarcomas of bone than has been possible in the past. In a previous publication,[2] giving observations on 20 bone sarcomas, certain characteristic features were described and their importance in diagnosis was pointed out; the utility of adhering to the histological classification of Borst was demonstrated and a tentative grouping into seven types, each

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[1] From the Department of Surgical Pathology of the Mt. Sinai Hospital, New York.

[2] Surg., Gyn., and Obstet., October, 1909, 431 to 401.